

CHAPTER 4

English Photogrammetric Mapping On CADD Systems

GENERAL

These guidelines are to be used for the preparation of all large-scale mapping of 1:1200 or larger.

COMPILATION

Mapping shall be compiled by photogrammetric methods using precision photogrammetric instruments. Unless otherwise stated, mapping standards designed for highway district use are to be used. See Exhibits A & B at the end of this chapter.

EDITING

Compilation drawings shall be prepared in such a way that maps possess clear symbol definition at the specified scale. These guidelines shall be used for the following items:

Line weights and styles	Text style
Lettering placement	Text size
Symbology	Treatment of marginal notes

MAP CONTENTS

Map Coordinates

A coordinate grid system shall be established for all mapping and be shown as follows:

- When hard copies are requested, grid ticks shall be spaced at 5 inch intervals.
- Grid values shall be shown on the mapping manuscripts and shall be placed approximately one inch from the sheet edge.
- The vertical and horizontal data shall be identified on a title sheet.

Whenever ground control surveys are **not** tied to survey monuments of the Illinois Plane Coordinate System, a system of plane coordinates, positive in value, shall be established and numbered so as to avoid any possibility of this arbitrarily established system being mistaken for the existing State system.

Unless otherwise specified, all ground control surveys for the mapping shall be tied to the survey monuments of the existing State Plane Coordinate System to the North American Datum of 1983.

Planimetry

The maps shall contain all planimetric features, which are visible or identifiable on, or are interpretable from, the aerial photography including land use features such as:

buildings	canals	ditches
reservoirs	trails	levees
railroads	ferry slips	quarries
borrow pits	cemeteries	orchards
wooded areas	individual large trees	culverts
bridges	trestles	tunnels
piers	retaining walls	dams
power plants	storage tanks (oil, water, etc.)	airfields
transportation terminals	curb & gutter	sidewalks
driveways	hydrants	manholes
telephone lines	telegraph lines	paved ditches
roads (highways)		
transformer & other substations		
electric power transmission lines, poles & towers.		

A field survey crew shall annotate features on photos that are not interpretable from the aerial photography. (See Exhibit D).

Buildings and similar dimensioned objects shall be correctly outlined and oriented, and shall be to actual size, except that dimensions smaller than 1/10 inch at map scale shall be symbolized by 1/10 inch in size. Minor irregularities in building outlines not represented by 1/20 inch at map scale shall be ignored.

The principal point of each photograph used in making the maps shall be shown on the maps.

Horizontal control stations used in making the maps shall be shown.

All mapped information shall be shown in accordance with the symbols, style, and line weights shown in Exhibit B.

Spot Elevations

Digital Terrain Mapping (DTM) does not require spot elevations.

Contours

Within accuracy requirements, contours shall be drawn to represent true elevation above mean sea level and the exact shape of the ground. Each contour shall be drawn as a solid line. Where the ground data is unreliable or cannot be seen due to heavy brush, tree cover, or other obstructions, it may be outlined with a VOID shape on level 60. The contours will be omitted in that area and the following note of explanation will be added to level 60, "GROUND DATA OMITTED DUE TO OBSTRUCTED VIEW". If you do not have this capability, the contours in such areas may be omitted or shown as dashed lines. The dashed lines shall be plotted as accurately as possible from the stereoscopic model. A note of explanation shall be added to the area.

To establish index contours, every fifth contour shall be accentuated as a heavier line than the intermediate four contours and shall be numbered according to its actual elevation above mean

sea level. Index values shall be placed every 5" at map scale.

Names & Labels

Text for control points and stand-alone objects shall be parallel to the main alignment. Labels for retaining walls, paved ditches, billboards, surface types may be parallel to the main alignment or to the object. Names for streets perpendicular to the main alignment should read from the right. Structures will be labeled parallel to the base of the structure.

DIGITAL TERRAIN MODEL DATA

The MicroStation 3D file format will be used for all map files that contain DTM data. Lines that represent breaklines will be 3D elements and symbols that represent mass points will be 2D cells. Within accuracy requirements, the vertices of the breaklines and the mass point symbols placed in the design file shall represent true elevation above mean sea level and represent the exact shape of the ground. The mass point grid spacing shall not exceed 30 feet and breaklines shall be developed to provide a true representation of the ground surface.

All DTM files will contain the following:

- standard map features (see MAP CONTENTS)
- mass points on level 32
- breaklines on level 56
- void lines on level 60
- generated contours on level 26
- a boundary polygon on level 56

Deliverables to the Department on digital CD-ROM will consist of:

- 3D file (use extension ". 3d") these files contain all mapping data.
- 2D file (use extension ". pln") these files contain planimetric features only.
- ASCII files (use extension ". asc") these files contain the DTM data in ASCII format.

Definitions

Voids are ground areas that cannot be seen by a stereoplotter operator. The cause is usually foliage, but can be structures. Void lines are not required where building "lean" obscures the ground. The "void" line can be made of any number of segments, but must be made into a MicroStation complex shape upon completion. These are used in GEOPAK as "Void" lines during data extraction. Voids can be used where the DTM applications create an incorrect interpretation of the ground. A bridge deck that begins after a cantilevered section of pavement is one instance where a void placed along the cantilevered section and around the deck solves such a problem. Void Lines also have additional specifications of line weight 2, line code 2, color 2 and a complex shape.

Boundary Polygons, sometimes referred to as Sewing Edges, surround each mapped model. They consist of segments of profile that touch on all DTM elements at the mapping limits. When completed, the segments are made into a MicroStation complex element, complex status dropped and used in GEOPAK as a "Boundary" element during data extraction. The purpose of this is to create a self-contained model, where contours stop at the map limits and can be recreated without the need for data from tie models. Boundary Polygons also have additional specifications of line weight 0, line code 2, color 14 and a complex element/dropped.

For further details on DTM, refer to the document titled “Standards for the Collection of Digital Terrain Model (DTM) Data”.

DISPOSITION DIAGRAM

A disposition diagram shall be prepared for each project to show the position and relationship of all mapping sheets and/or models to each other. The diagram shall include the following:

- coordinate system used to control the project
- proper positioning of horizontal ground control
- sheet layout and the delineation of the mapping model
- principal points and photo number of each photograph
- north arrow cell (c00294)
- model/file names
- sketch of roadway
- mapping limits
- date prepared
- initials of preparer
- scale of photography
- scale of diagram
- building classification cell (c00309)
- legend of symbols cell (c00391)
- disclaimer note cell (c00312)
- grid factor note with horizontal and vertical notes cell (c00301 for NAD 83 or c00293 for NAD 27)
- arbitrary grid note cell (c00322)
- title block cell (c00290)

A title block is to be included which shall consist of the following:

- scale of the mapping
- contour interval
- project numbers (Aerial Surveys & District)
- date of photography
- county(s) wherein the project lies
- brief geographical description of the location of the project

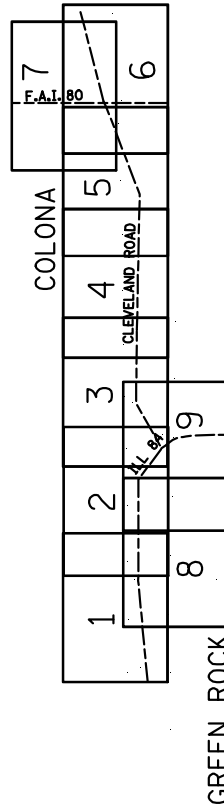
TITLE SHEET

A title sheet shall be prepared for each photogrammetric project. The sheet shall include:

- north arrow cell (c00294)
- grid factor note with horizontal and vertical notes cell (c00301 for NAD 83 or c00293 for NAD 27)
- graphical relationship of mapping sheets to each other and/or stereo models to each other
- listing of mapping sheets with corresponding alpha-numeric CADD Design File identification for each stereoscopic model
- sketch of centerline and major crossroads

TITLE SHEET

D-1622



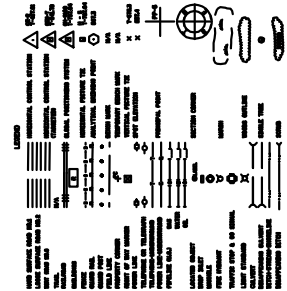
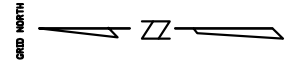
SHEET 1	SHEET 3	SHEET 5	SHEET 7	SHEET 9
01	05	09	21	18
02	06	10		19
SHEET 2	SHEET 4	SHEET 6	SHEET 8	
03	07	11	16	
04	08	12	17	

STATE OF ILLINOIS
DEPARTMENT OF TRANSPORTATION
DIVISION OF HIGHWAYS
BUREAU OF DESIGN AND ENVIRONMENT
PREPARED BY

PROJECT NO. _____
SHEET NO. _____
SHEET TOTAL _____
SHEET TOTAL _____

MAP SCALE 1"=100' CONTOUR INTERVAL 5'.

TITLE SHEET
DESIGNED BY: PROFESSIONAL ENGINEER FROM ILLINOIS REGISTERED PROFESSIONAL ENGINEER
E-92-095-84 D-1622



CLASSIFICATION OF BUILDINGS

C	= COMMERCIAL
R	= RESIDENCE
G	= GARAGE
S	= SHED
B	= BARN
M.H.	= MOBILE HOME

THIS MAP IS BASED ON THE ILLINOIS
STATE PLANE COORDINATE SYSTEM
TO THE GEODETIC REFERENCE SYSTEM OF
1983. HORIZONTAL DISTANCE SHALL BE
DISTANCE DIVIDED BY A RED FACTOR OF .999999
MAP STATE PLANE COORDINATES
REFLECT THIS VALUE

THIS MAP MEETS THE REQUIREMENTS FOR THE ILLINOIS
STATE PLANE COORDINATE SYSTEM AS Laid Out in the
ILLINOIS STATE PLANE COORDINATE SYSTEM ACT AND
THE ILLINOIS STATE PLANE COORDINATE SYSTEM RULES
AND REGULATIONS. THE ILLINOIS STATE PLANE COORDINATE
SYSTEM RULES ARE ONLY APPLICABLE TO THE ILLINOIS COORDINATE RULES.

- legend of symbols cell (c00391)
- building classification cell (c00309)
- title block cell (c00290)
- project number (Aerial Surveys)
- statement about the compilation method
- disclaimer note cell (c00312)

See Exhibit C for example of legend, title block, and building classifications.

FINISHED MAPS

Digital Format

All digital files containing map data will be delivered on storage media as required in the Computer Aided Drafting Electronic Data Transfer Standards. The files with the following extensions will be on this media: .3d, .pln, and .asc. See page xxx. A file with the layout of the models will be included. All photo enlargements containing identified cultural data, a control sketch and adjusted ground control data shall be included in a hard copy format.

Hard Copy Format

When a hard copy of the mapping is required, it shall be prepared on a double matte polyester film base of 0.004 inch thickness with a maximum width of 42 inches and a maximum length of 56 inches. All map details shall be plotted in a reverse reading format (data plotted on back side of polyester film). Each polyester film sheet shall be numbered in sequence and contain a north arrow and a title block. Labels were indicating sheet matches shall be included. A hard copy of a title sheet shall be included.

DIGITAL ORTHOPHOTO MAP PREPARATION

Orthophoto maps shall be prepared by using rectified digital imagery of the aerial photography. The digital imagery shall be coordinated with the same coordinate system used for the line mapping. All files of the digital orthophotos shall be compatible with the IDOT's MicroStation CADD system to allow the DTM files and generated contour files to be directly merged with the digital imagery to produce an orthophoto map.

Features such as road names, cities, rivers, creeks and streams are to be labeled.

A selection of contour colors shall be one that will have the most contrast with the predominant tone of the orthophoto when making hard copies. Hard copies shall be plotted on a stable polyester film with a minimum thickness of 0.004 inches.

The final orthophoto map shall not contain any mismatched imagery that interfere with the interpretability of ground features or that are esthetically objectionable. Mismatches exceeding 0.04 inch are generally unacceptable and may be cause for rejection. Other defects that could cause rejection include out-of-focus imagery and inconsistencies in tone and density between individual orthophotos and/or adjacent map sheets.

DIGITAL ORTHOPHOTO PREPARATION

Digital orthophotos shall be prepared according to the IDOT document entitled "ILLINOIS DEPARTMENT OF TRANSPORTATION - SPECIFICATIONS FOR DIGITAL IMAGERY PRODUCTS."

TITLE BLOCKS

Each orthophoto map sheet shall contain the following title information:

- scale of mapping & contour interval
- project numbers (Aerial Surveys & District)
- sheet number
- project county(s)
- brief geographical description of project location
- compilation method
- photography date
- preparing agency
- North Arrow

See Exhibit C.

ACCURACY

All dimensions and measurements are applicable as specified by National Mapping Standards (NMS) in "Specifications for Aerial surveys and Mapping by Photogrammetric Methods for Highways," U. S. Department of Transportation, Federal Highway Administration, (rev.1986). The following sections restate their specifications.

Horizontal

Ninety (90) percent of all planimetric features shall be shown on the finished map, accurate to within 1/40th of an inch of their true coordinate position, as stated in NMS. None of the planimetric features shown shall vary more than 1/20th of an inch, from their true coordinate position, at map scale. Horizontal Control points on the map shall be plotted to an accuracy of 0.01 inches of their true horizontal coordinate position.

Coordinate Grid Lines or Tics on the map shall be plotted to an accuracy of 0.01 inches of their true horizontal coordinate position.

Vertical

Break lines and mass points in Digital Terrain Models (DTM's) shall be accurate to the extent that contours generated from their use will meet the vertical accuracy stated below.

Ninety (90) percent of contours appearing on a map, whether by conventional photogrammetric mapping or use of DEM / DTM's, shall be accurate within one-half (1/2) of the final map's contour interval, regarding vertical. Of the remaining ten (10) percent, none shall be in error by more than one (1) contour interval on the final map. Where conditions prevent attainment of this standard, use of a VOID shape (as defined for use in GEOPAK), or dashed contours, is recommended.

Checks of Map Accuracy

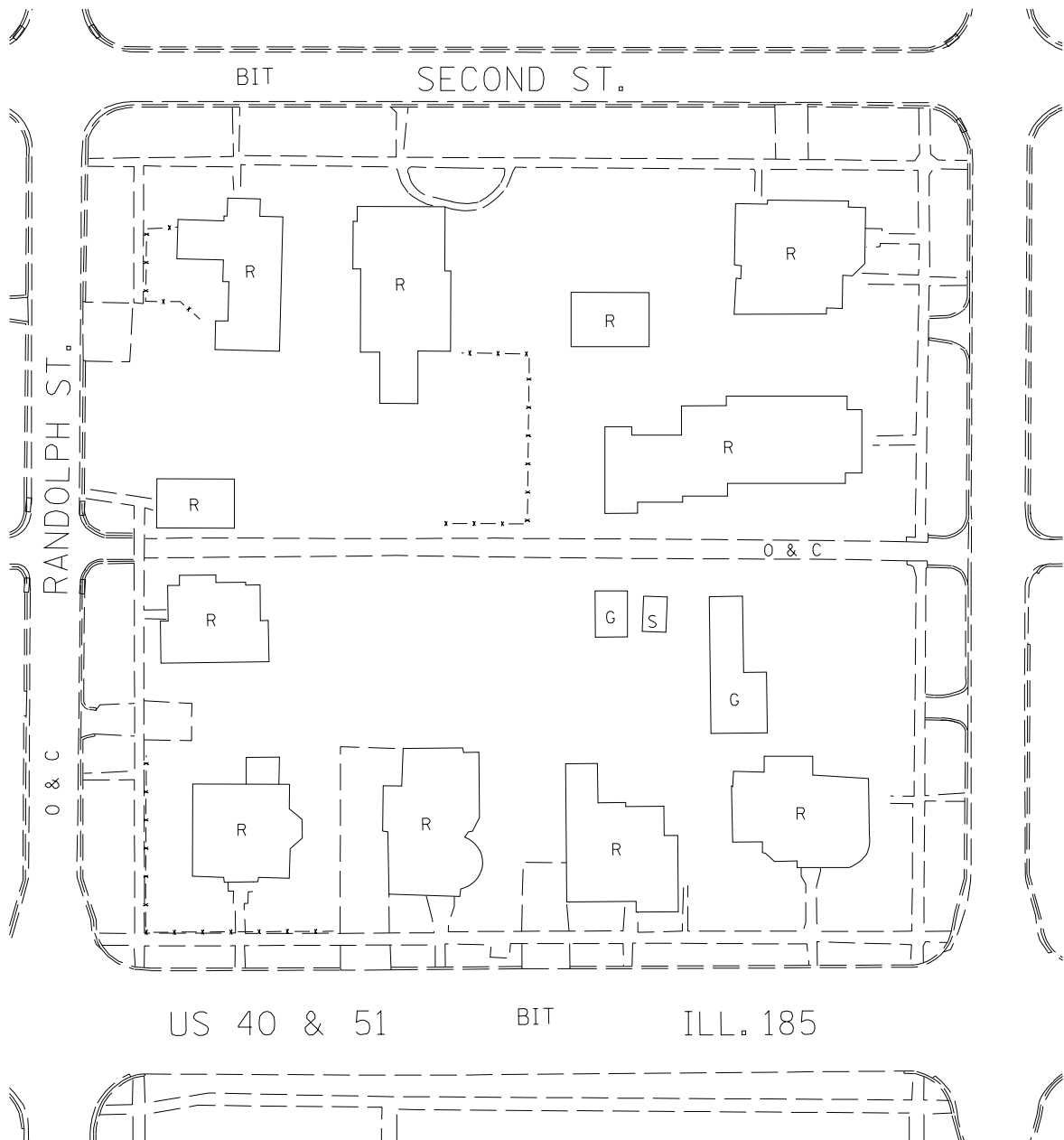
Any post-mapping checks will consist of closed traverses, using the original basic control survey markers from which to proceed. Survey accuracy will conform to that of the basic control.

EXHIBIT A.

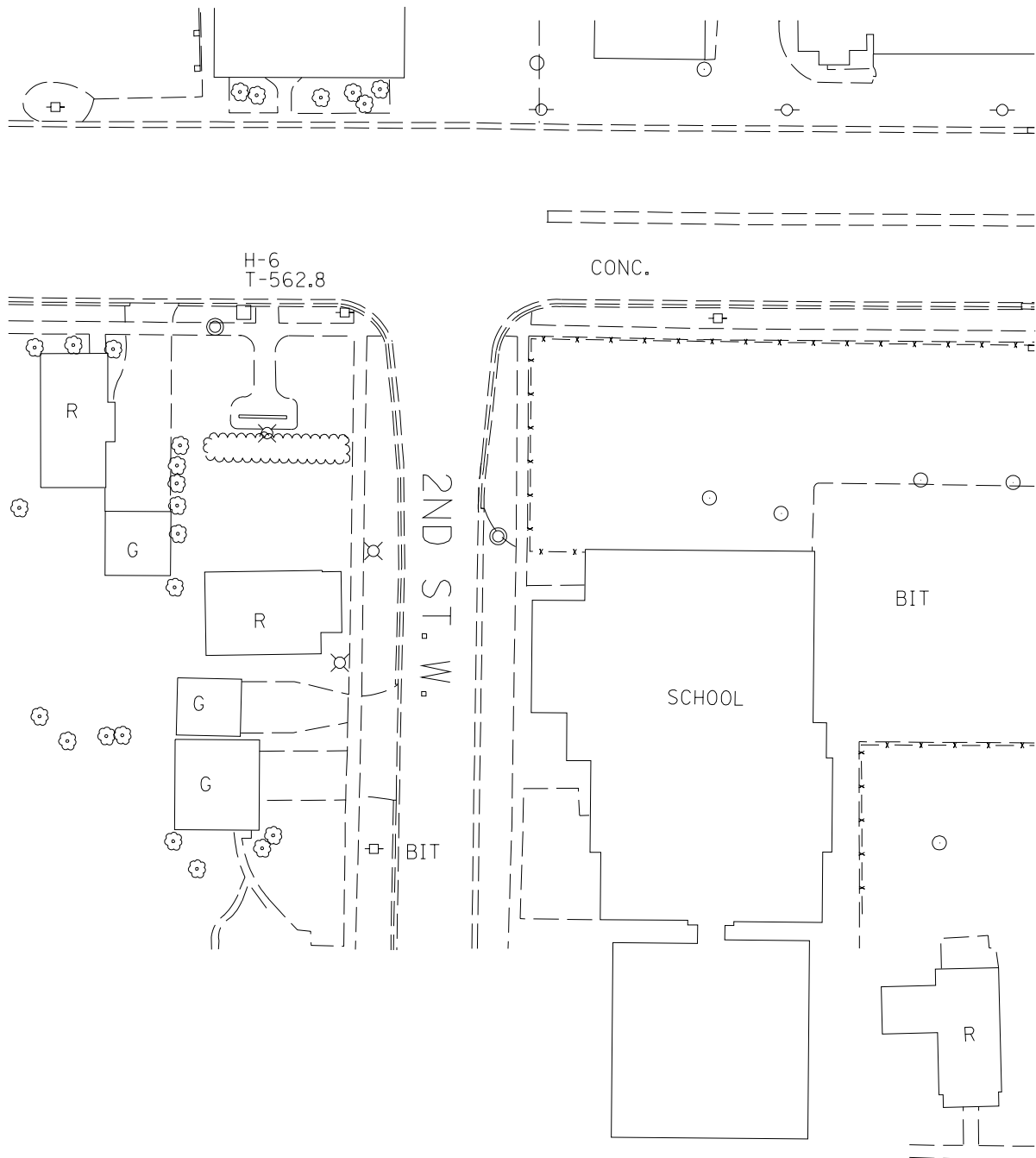
GUIDELINES FOR USING DISTRICT STANDARDS GENERAL INFORMATION FOR PLOTTERS AND EDITORS

- I. OPENINGS and CLOSURES: (see examples on page A-4)
 - A. ALL PUBLIC roads open to each other regardless of surface type
 - 1. side streets
 - 2. alleys
 - 3. frontage roads
 - B. ALL PRIVATE and COMMERCIAL entrances closed at public roads regardless of surface type
 - 1. driveways
 - 2. parking lots (public and private)
 - 3. field entrances
- II. CURBS and GUTTERS: (see examples on page A-5)
 - A. Show gutter edge only when well defined and/or dimensioned, otherwise, show two parallel lines one (1) foot apart or to scale if applicable
 - 1. back line represents back of curb (level 28)
 - 2. front line represents face of curb (level 28)
 - 3. gutter line represents edge of pavement (level 27)
 - B. Where applicable, carry gutter lines across all openings
 - 1. back line represents face of curb continuation (level 28)
 - 2. front line represents edge of pavement (level 27)
- III. SIDEWALKS, ALLEYS and ENTRANCES: (see examples on page A-6)
 - A. Do not break the principal edge
 - 1. if the entrance goes through the sidewalk - break sidewalk
 - 2. if the sidewalk goes through the entrance - break entrance
 - 3. if the alley goes through the sidewalk - break sidewalk
 - 4. if the sidewalk goes through the alley - break alley
 - B. Show alley edges when they can be seen or located by a dimension. Alleys are to be labeled only under the following conditions:
 - 1. if alley is dimensioned but cannot be located - label as alley along with the dimension (example: 12' ALLEY)
 - 2. if edges cannot be interpreted and no dimensions given - label as alley (example: ALLEY)

- IV. PAVEMENTS and SHOULDERS: (see examples on page A-7)
 - A. Do not show unpaved shoulders
 - B. Show paved shoulders only when well defined and/or dimensioned
 - 1. if dimensioned and cannot be seen - show out to out
 - C. Show all entrance edges as seen and extend to hard surface
 - 1. if shoulder is paved - stop at shoulder
 - 2. if shoulder is not paved - stop at pavement edge
 - 3. if radii are visible - show them
 - 4. if radii are not visible - use straight lines
- V. SURFACE TYPES (other than roads, alleys, etc.): (see page A-8)
 - A. Identified surface types
 - 1. plot and label
 - 2. show line of delineation if visible
 - B. Unidentified surfaces with visible surface type changes
 - 1. plot
 - 2. do not label
- VI. ANNOTATIONS:
 - A. Label all identified objects
 - 1. if an object can be identified - label it (sign, billboard, etc.)
 - 2. if object mislabeled on photo - correct and note on photo
 - 3. do not label symbolized objects (trees, power & telephone poles, etc.)
 - B. Text for plan features
 - 1. place in open area if possible
 - 2. do not break contours for text
 - C. Text other than plan features
 - 1. plotter will break as before
 - 2. editor will not break or move if text is legible

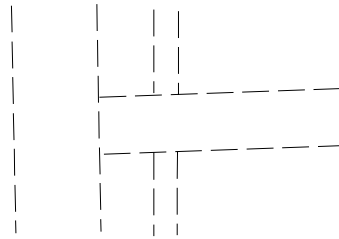


EXAMPLES OF OPENINGS AND CLOSURES

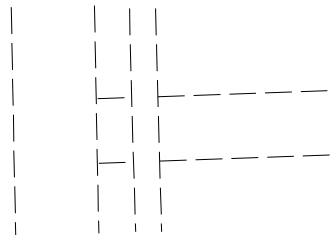


EXAMPLE OF CURBS & GUTTERS

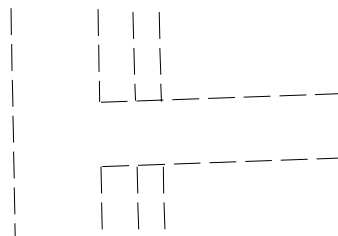
DRIVE AND SIDEWALK



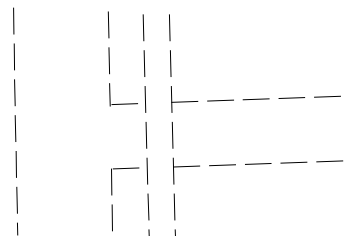
DRIVE AND SIDEWALK



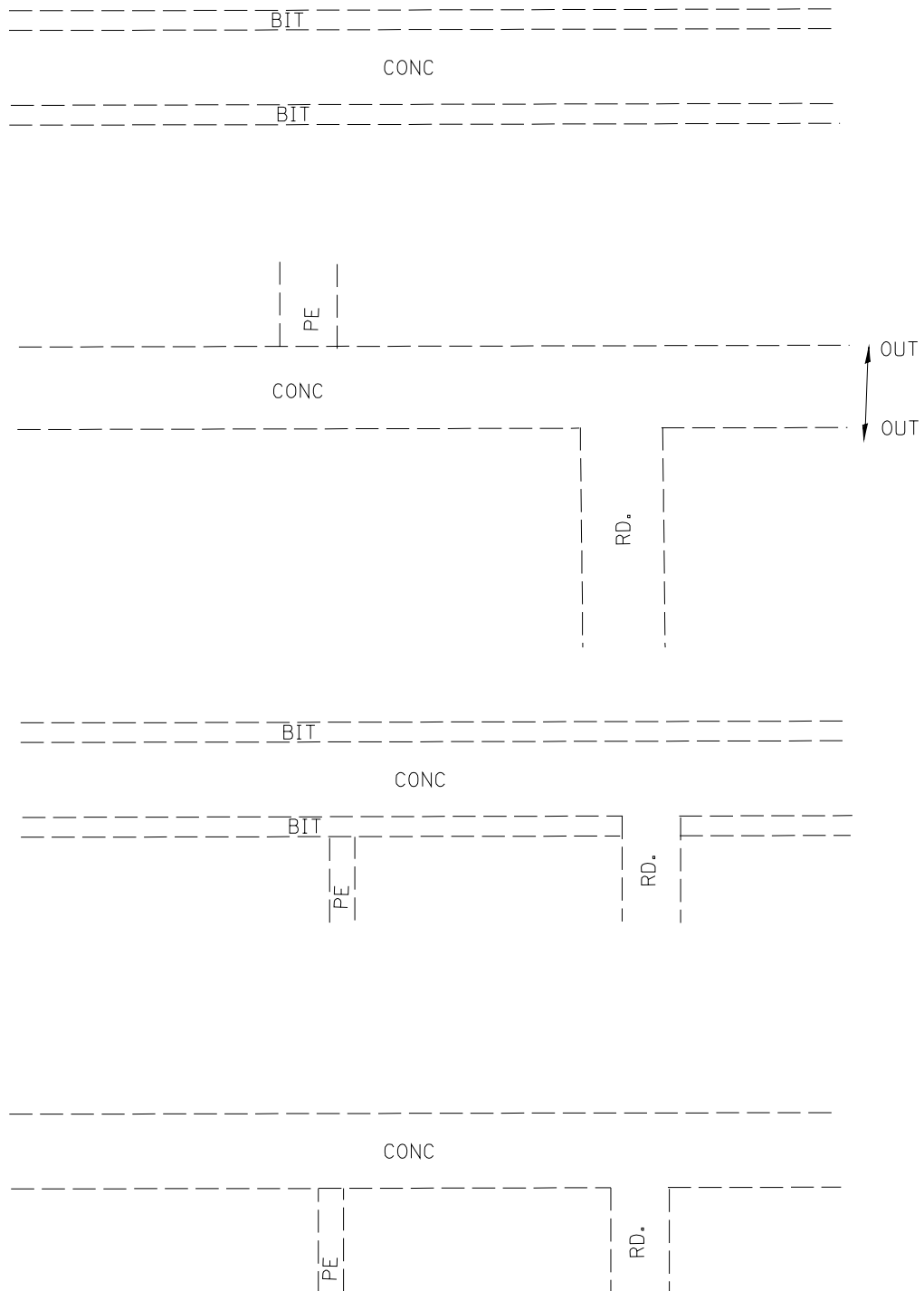
ALLEY AND SIDEWALK



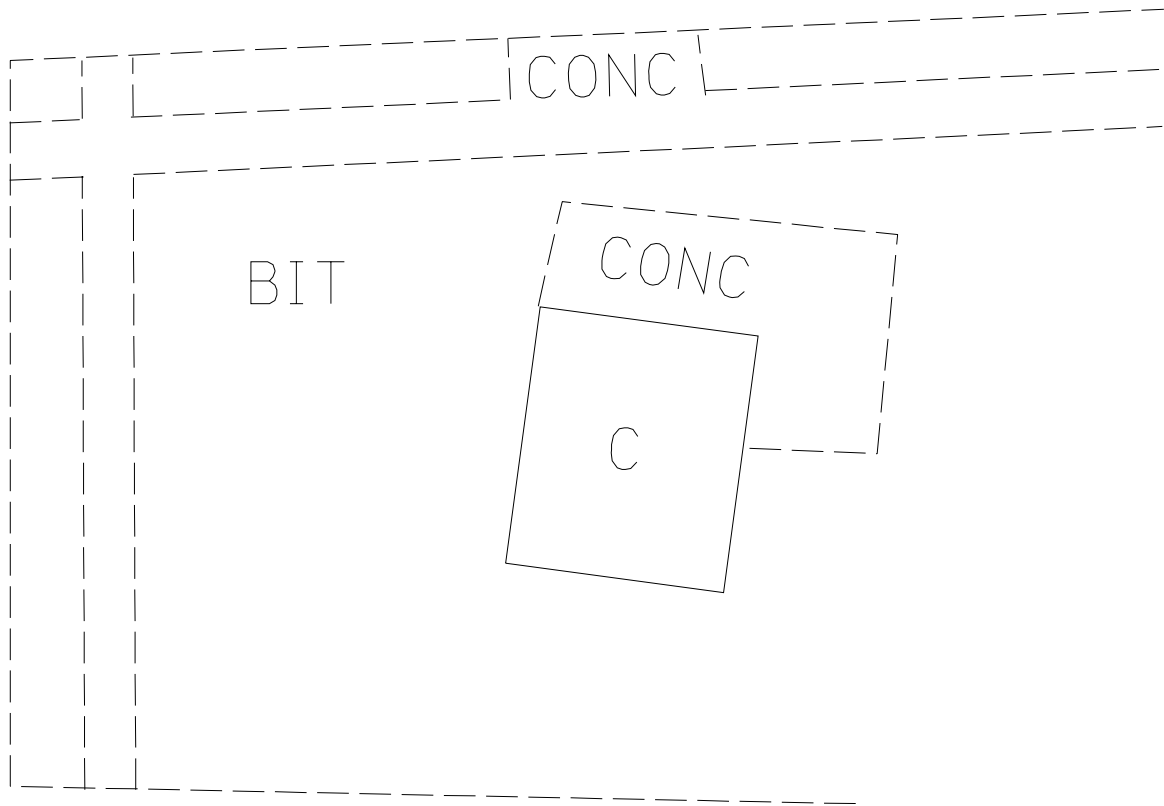
ALLEY AND SIDEWALK



EXAMPLES OF SIDEWALKS, ALLEYS AND ENTRANCES



EXAMPLES OF PAVEMENT AND SHOULDERS



SURFACE TYPES (OTHER THAN ROADS AND ALLEYS)

EXHIBIT B-1

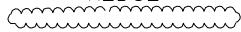






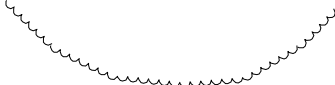



HEDGE LEVEL 4: VEGETATION	 HEDGE	<u>LS</u> e0265
ORCHARD OR NURSERY LEVEL 4: VEGETATION	 OR  PLOT TRUE POSITION OR OUTLINE AND ADD TEXT	<u>CELL</u> C00170 OR <u>LINE</u> WT=2 LC=4
SCRUB AND VEGETATION OUTLINE (LABEL IS A CELL) LEVEL 4: VEGETATION	 SCRUB	<u>LS</u> e0265 <u>CELL</u> C00264
SHRUB AND BUSHES OUTLINE LEVEL 4: VEGETATION	 BUSHES	<u>LS</u> e0265
SINGLE TREE OR BUSH LEVEL 4: VEGETATION		<u>CELL</u> C00170
STUMP LEVEL 4: VEGETATION		<u>CELL</u> C00263
WOODS OUTLINE LEVEL 4: VEGETATION		<u>LS</u> e0265
DISAPPEARING DITCH LEVEL 5: WATER		<u>CELL</u> C00361 <u>LINE</u> LC=6
FLOW ARROW LEVEL 5: WATER	 ARROWHEAD SHOULD FORM A DISTINCT POINT	
INTERMITTENT POND LEVEL 5: WATER	 INTERMITTENT WATER	<u>LINE</u> LC=6

EXHIBIT B-2

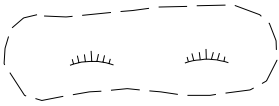

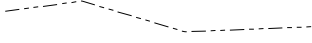


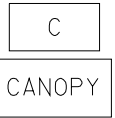

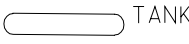


MARSH OR SWAMP LEVEL 5: WATER		CELL C00171	LINE LC=3
SHORELINE OF POND OR LAKE LEVEL 5: WATER			LINE LC=6
STREAM OR DRAINAGE DITCH LEVEL 5: WATER			LINE LC=6
STREAM, RIVER, OR CREEK LEVEL 5: WATER		TEXT WT=1 TX=5	LINE LC=6
RIGHT OF WAY MARKER LEVEL 6: BOUNDARIES		CELL C00172	
CANOPY LEVEL 8: CULTURE		TEXT WT=1	
CEMETERY LEVEL 8: CULTURE			LINE LC=3
COMMERCIAL TANK (PERMANENT) LEVEL 8: CULTURE			
CONCRETE SURFACE (SLAB, PATIO, MOBILE HOME PAD, ETC.) LEVEL 8: CULTURE			LINE LC=3
CONVEYOR BELT LEVEL 8: CULTURE			

EXHIBIT B-3

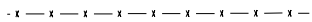
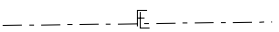
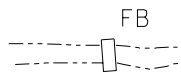



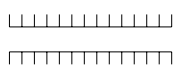



FENCE (ALL TYPES)		<div>LS</div> <div>e0493</div>
LEVEL 8: CULTURE		
FIELD LINE (APPARENT)		<div>CELL</div> <div>C00233</div> <div>LINE</div> <div>LC=4</div>
LEVEL 8: CULTURE		
FOOTBRIDGE		
LEVEL 8: CULTURE		
FOUNDATIONS		<div>LINE</div> <div>LC=3</div>
LEVEL 8: CULTURE		
GOLF GREEN (LABEL IS A CELL) LEVEL 8: CULTURE		<div>CELL</div> <div>C00237</div>
HOUSE OR STRUCTURE	<div></div> <div>C =COMMERCIAL HSE =HOUSE G =GARAGE S =SHED B =BARN MBH =MOBILE HOME</div>	<div>TEXT</div> <div>WT=1</div>
LEVEL 8: CULTURE		
LEVEE		<div>CELL</div> <div>C00111</div>
LEVEL 8: CULTURE		
LOCATED OBJECT OR LANDMARK		<div>CELL</div> <div>C00239</div>
LEVEL 8: CULTURE	LABEL IF KNOWN	
MAILBOX		<div>CELL</div> <div>C00112</div>
LEVEL 8: CULTURE		
MINING AREA		<div>LINE</div> <div>LC=3</div>
LEVEL 8: CULTURE		

EXHIBIT B-4

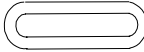





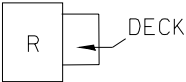
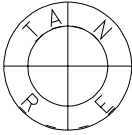


RACETRACK LEVEL 8: CULTURE	 RACETRACK	
SAND TRAP (LABEL IS A CELL) LEVEL 8: CULTURE	 SAND TRAP	<u>CELL</u> C00238
SIGNS MISCELLANEOUS COMMERCIAL LEVEL 8: CULTURE	 SIGN BILLBOARD	<u>CELL</u> C00125
SWIMMING POOL (LABEL IS A CELL) LEVEL 8: CULTURE	 POOL	<u>CELL</u> C00234
WALL, MASONRY, STONE (RETAINING WALL) LEVEL 8: CULTURE	 RET WALL	
WELL (OIL, WATER) LEVEL 8: CULTURE	 OIL WELL	<u>CELL</u> C00239
WOODEN DECK LEVEL 8: CULTURE	 R DECK	
SECTION CORNER (APPARENT) LEVEL 12: BOUNDARIES		<u>CELL</u> C00132
ABOVE GROUND SPLICE (TEL) (ELEC) ETC. LEVEL 14: UTILITIES LEVEL 18: TEXT	 (TEL)	<u>CELL</u> C00488
FIRE HYDRANT LEVEL 14: UTILITIES		<u>CELL</u> C00167

EXHIBIT B-5






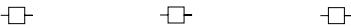
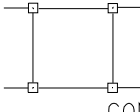
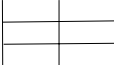
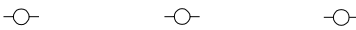

GUY POLE (LABEL IS A CELL) LEVEL 14: UTILITIES LEVEL 18: TEXT		<u>CELL</u> C00244 C00257
HANDHOLES LEVEL 14: UTILITIES		<u>CELL</u> C00487
LIGHT STANDARD LEVEL 14: UTILITIES		<u>CELL</u> C00165
MANHOLE (UTILITY) LEVEL 14: UTILITIES		<u>CELL</u> C00168
PIPELINE (ABOVE GROUND) LEVEL 14: UTILITIES LEVEL 18: TEXT	 PLOT TO SCALE	
POWER LINE LEVEL 14: UTILITIES		<u>CELL</u> C00119
POWER TRANSMISSION TOWER LEVEL 14: UTILITIES	 CONNECT BASES	<u>CELL</u> C00245
SEWAGE DISPOSAL BEDS LEVEL 14: UTILITIES LEVEL 18: TEXT	 SEWAGE DISPOSAL	
TELEPHONE OR TELEGRAPH LINE LEVEL 14: UTILITIES		<u>CELL</u> C00121
TRAFFIC SIGNAL LEVEL 14: UTILITIES		<u>CELL</u> C00164

EXHIBIT B-6




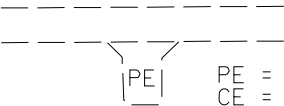

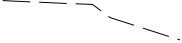
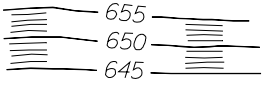
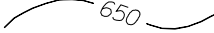
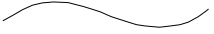
TRANSFORMER BOXES & VAULTS LEVEL 14: UTILITIES LEVEL 18: TEXT	PLOT TO SCALE  LABEL IF ANNOTATED ON PHOTO	
UTILITY METERS & VALVES LEVEL 14: UTILITIES LEVEL 18: TEXT	 WM WM=WATER METER WV=WATER VALVE GM=GAS METER GV=GAS VALVE	<u>CELL</u> C00357
UTILITY WARNING SIGN (TEL)(GAS) ETC. LEVEL 14: UTILITIES LEVEL 18: TEXT	 (GAS)	<u>CELL</u> C00356
ENTRANCES LEVEL 16: TEXT LEVEL 25: MIN PVMT ED	 PE PE = PRIVATE CE = COMMERCIAL FE = FIELD	<u>LINE</u> LC=3
SURFACES, SUCH AS SIDEWALKS, DRIVEWAYS, PARKING LOTS LEVEL 16: TEXT LEVEL 25: MIN PVMT ED	 BIT CONC	<u>LINE</u> LC=3
TRAIL LEVEL 25: MINOR PAVT EDGE		<u>LINE</u> LC=3
BROKEN CONTOURS (BROKEN DUE TO INDEX CONTOURS BEING 1/4" OR LESS APART) LEVEL 26: CONTOURS	 655 650 645	
INDEX CONTOUR LEVEL 26: CONTOURS	 650	<u>TEXT</u> <u>LINE</u> WT=1 WT=3 CO=0 FT=23
INTERMEDIATE CONTOUR LEVEL 26: CONTOURS		<u>LINE</u> CO=19

EXHIBIT B-7



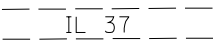
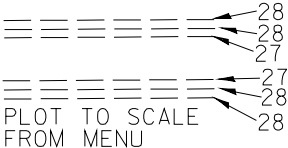


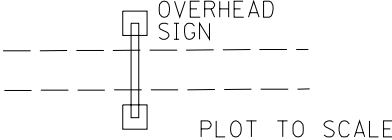


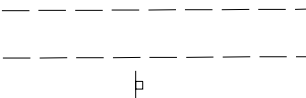
SINK OR DEPRESSION WITH TOP INSIDE LEVEL 26: CONTOURS		<u>PATTERN</u> C00277 INTERMEDIATE C00278 INDEX C00280 DASHED INTM. C00281 DASHED INDEX						
AIRFIELD LEVEL 16: TEXT LEVEL 27: MAJ PVMT ED		<table><tr><td><u>TEXT</u></td><td><u>LINE</u></td></tr><tr><td>WT=1</td><td>LC=3</td></tr><tr><td>TX=*</td><td></td></tr></table> * TEXT SIZE VARIES	<u>TEXT</u>	<u>LINE</u>	WT=1	LC=3	TX=*	
<u>TEXT</u>	<u>LINE</u>							
WT=1	LC=3							
TX=*								
ROADS & ALLEYS LEVEL 16: TEXT LEVEL 27: MAJ PVMT ED		<table><tr><td><u>TEXT</u></td><td><u>LINE</u></td></tr><tr><td>WT=1</td><td>LC=3</td></tr><tr><td>TX=5</td><td></td></tr></table>	<u>TEXT</u>	<u>LINE</u>	WT=1	LC=3	TX=5	
<u>TEXT</u>	<u>LINE</u>							
WT=1	LC=3							
TX=5								
ROADS WITH CURB & GUTTER LEVEL 27: MAJ PVMT ED LEVEL 28: OTHER PVMT ITEMS		<table><tr><td></td><td><u>LINE</u></td></tr><tr><td></td><td>LC=3</td></tr></table>		<u>LINE</u>		LC=3		
	<u>LINE</u>							
	LC=3							
GUARDPOST LEVEL 28: OTHER PVMT ITEMS		<u>CELL</u> C00216						
GUARDRAIL LEVEL 28: OTHER PVMT ITEMS		<u>LS</u> e0107						
OVERHEAD SIGN LEVEL 16: TEXT LEVEL 28: OTHER PVMT ITEMS								
ROADS WITH CURBING LEVEL 16: TEXT LEVEL 28: OTHER PVMT ITEMS		<table><tr><td><u>LINE</u></td></tr><tr><td>LC=3</td></tr></table>	<u>LINE</u>	LC=3				
<u>LINE</u>								
LC=3								
RUMBLE STRIP LEVEL 16: TEXT LEVEL 28: OTHER PVMT ITEMS		<table><tr><td><u>LINE</u></td></tr><tr><td>LC=3</td></tr></table>	<u>LINE</u>	LC=3				
<u>LINE</u>								
LC=3								
SMALL SINGLE POST TRAFFIC SIGN LEVEL 28: OTHER PVMT ITEMS		<u>CELL</u> C00179						

EXHIBIT B-8





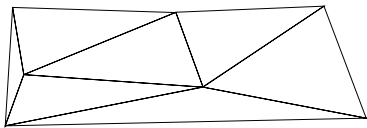
ANALYTICAL AERIAL TRIANGULATION POINT LEVEL 30: CONTROL		<u>CELL</u> C00206
HORIZONTAL CONTROL STATION (TARGETED) (FIELD) LEVEL 30: CONTROL	 9301 T-541.78	<u>CELL</u> C00202
NGS HORIZONTAL CONTROL STATION (TARGETED) (FIELD) LEVEL 30: CONTROL	 NGS GARFIELD ELEV 674.15	<u>CELL</u> C00202
NGS VERTICAL CONTROL STATION (BENCH MARK) LEVEL 30: CONTROL	× NGS BM R-146 ELEV 678.67	<u>CELL</u> C00205
PRINCIPAL POINT LEVEL 30: CONTROL	 PP-5	<u>CELL</u> C00207
TEMPORARY BENCH MARK LEVEL 30: CONTROL	× TBM-3 ELEV 674.10	<u>CELL</u> C00205
USGS VERTICAL CONTROL STATION (BENCH MARK) LEVEL 30: CONTROL	× USGS BM-UE-807-B-1 ELEV 436.78	<u>CELL</u> C00205
VERTICAL PICTURE TIE (FIELD) LEVEL 30: CONTROL	× T-421.30	<u>CELL</u> C00205
DTM MASS POINT LEVEL 32: POINTS	×	<u>CELL</u> C00283
DTM TRIANGLES LEVEL 36: TRIANGLES		<u>LINE</u> C0=63

EXHIBIT B-9

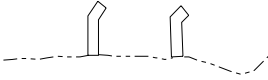
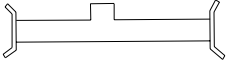
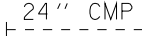

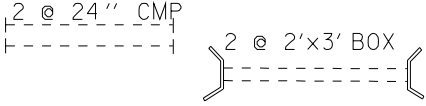
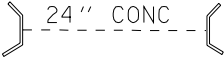
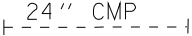


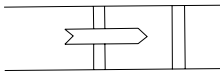



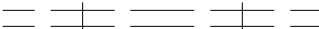


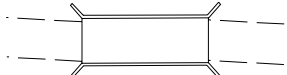
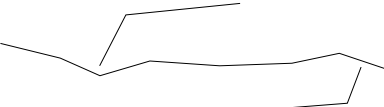
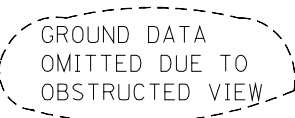
BREAKWATERS LEVEL 37: DRAINAGE		<u>LINE</u> WT=1
DAM, MASONRY LEVEL 37: DRAINAGE		<u>LINE</u> WT=1
DISAPPEARING CULVERT LEVEL 22: DR. NOTES LEVEL 37: DRAINAGE	24" CMP 	<u>CELL</u> C00110 <u>LINE</u> LC=5
DITCH CHECK LEVEL 37: DRAINAGE		<u>CELL</u> C00163
DOUBLE OR MULTIPLE CULVERTS LEVEL 22: DR. NOTES LEVEL 37: DRAINAGE	2 @ 24" CMP  2 @ 2'x3' BOX PLOT HEADWALLS TO SCALE	<u>CELL</u> C00110 <u>LINE</u> WT=0 LC=5 <u>LINE</u> WT=1 LC=0
EXISTING CULVERT WITH HEADWALLS LEVEL 22: DR. NOTES LEVEL 37: DRAINAGE	24" CONC  PLOT HEADWALLS TO SCALE	<u>LINE</u> WT=1 LC=0 <u>LINE</u> WT=0 LC=5
EXISTING CULVERT LEVEL 22: DR. NOTES LEVEL 37: DRAINAGE	24" CMP 	<u>CELL</u> C00110 <u>LINE</u> LC=5
INLET LEVEL 22: DR. NOTES LEVEL 37: DRAINAGE	 ADD TEXT IF NECESSARY TO DISTINGUISH	<u>CELL</u> C00169
MANHOLE (DRAINAGE) LEVEL 37: DRAINAGE		<u>CELL</u> C00150
PASSABLE LOCKS LEVEL 37: DRAINAGE		<u>LINE</u> WT=1

EXHIBIT B-10

PIERS LEVEL 37: DRAINAGE		$\frac{\text{LINE}}{\text{WT}=1}$
SEAWALL LEVEL 37: DRAINAGE		$\frac{\text{LINE}}{\text{WT}=1}$
SLUICE GATE LEVEL 37: DRAINAGE		$\frac{\text{LINE}}{\text{WT}=1}$
ABANDONED RAILROAD WITH OR WITHOUT RAILS LEVEL 38: RAILROAD		$\frac{\text{LS}}{\text{e0221}}$
RAILROAD LEVEL 16: TEXT LEVEL 38: RAILROAD		$\frac{\text{LS}}{\text{e0134}} \quad \frac{\text{TEXT}}{\text{WT}=1}$
RAILROAD TUNNEL LEVEL 16: TEXT LEVEL 38: RAILROADS		$\frac{\text{LS}}{\text{e0134}} \quad \frac{\text{TEXT}}{\text{WT}=0 \text{ TX}=*}$ * TEXT SIZE VARIES
BRIDGE, ARCH, SUSPENSION, LARGE BOX CULVERT, ETC. LEVEL 39: STRUCTURE		
DTM BREAK LINES LEVEL 56: BREAK LINES		$\frac{\text{LINE}}{\text{CO}=14}$
VOIDS LEVEL 60:		$\frac{\text{LINE}}{\text{CO}=2} \quad \text{LS}=2 \quad \text{WT}=2$ COMPLEX SHAPE